

**Remarks/Arguments:**

Claims 1-7 and 9-21 were the pending claims in this application. With this Amendment, claims 5 and 10-14 have been cancelled without prejudice or disclaimer of the subject matter thereof. Therefore, claims 1-4, 6, 7, 9, and 15-21 are now the pending claims in this application.

Claims 1, 6, 9, and 19 are currently amended. The amendment to claims 1 and 9 are based in part on pending claim 19 and are supported in the specification at, for example, page 5, lines 12 and 13. Claims 6 and 19 have also been amended based on the amendments to claims 1 and 9. No new matter has been added.

Applicant notes that claim 1 has been amended to incorporate a limitation of pending claim 19. Claim 19 was argued in the last response. Namely, it was expressly argued that Hu et al. fails to disclose or suggest directly reducing the cobalt compound without a calcining step. This argument was not addressed in the Final Office Action, however. As noted in M.P.E.P. § 707.07(f): "Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it." Therefore, while Applicant has amended claims 1 and 9, it should not raise new issues requiring further consideration or search because "directly reducing the cobalt compound without a calcining step" was previously presented and specifically argued in the prior response. Accordingly, Applicant requests consideration and allowance of all pending claims, which now specify "directly reducing the cobalt compound without a calcining step," because this feature was already claimed but not addressed in the final Office Action.

**Rejections under 35 U.S.C. §103**

Claims 1-7, 9 and 15-21 stand rejected as unpatentable over U.S. Patent No. 7,452,844 (Hu et al.). Claims 1-7, 9 and 15-21 stand rejected as unpatentable over Hu et al. in view of U.S. Patent No. 6,927,190 (Lok '190) or U.S. Patent No. 6,534,436 (Lok '436). Applicant traverses these rejections and submits that the currently pending claims are patentable over these cited references for at least the reasons set forth below.

"To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. §2143. Additionally, as set forth by the Supreme Court in KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398 (2007), it is necessary to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed.

Applicant maintains that Lok '190 and Lok '436 only qualify as prior art under 35 U.S.C. § 102(e), which *cannot* be used in an obviousness rejection if the reference was owned by the Applicant at the time of the invention of the present application. Applicant does not dispute that the references qualify under Section 102(e). Applicant disputes the Office's assertion that a Section 102(e) reference can be used in an obviousness rejection, as done here, if it is owned by the Applicant at the time of the invention of the present application. Section 103(c)(1) states:

Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Lok '190 is owned by Johnson Matthey and was owned by the Applicant at the time of the invention of the present application. Lok '436 was the subject of an assignment by Imperial Chemical Industries PLC to Johnson Matthey PLC and was owned by the Applicant at the time of the invention of the present application. Accordingly, neither Lok '190 nor Lok '436 can be used in an obviousness rejection. The Applicant recognizes, however, that Lok '190 and Lok '436 correspond to WO01/87480 (the '480 Publication) and WO 01/62381 (the '381 Publication), respectively, which were both published more than one year before the international filing date of this application. For purposes of responding to the Examiner's objections, the content of these publications is considered.

With respect to the Declaration of the inventor, Lok, provided with the last response, Applicant notes that the purpose of the Declaration was to demonstrate that catalysts made by the claimed method were different than those in Hu et al., which discloses crystallite sizes that are *greater than* 60 Angstroms. See e.g., Figure 6 of Hu et al. The crystallites formed using the claimed method of direct reduction are smaller than those of Hu et al. (e.g., on the order of

40Å) Thus, the catalysts are different, and the catalyst obtainable from the claimed invention is effective despite the fact that it is titania supported.

**Claims 1-4, 6, 7, 9 and 15-21**

Applicant respectfully submits that a *prima facie* case of obviousness has not been shown because Hu et al., alone or in combination with the '481 Publication or the '381 Publication, fails to disclose or suggest directly reducing the cobalt compound without a calcining step.

Claim 1, as currently amended, recites:

A process for manufacturing a catalyst which comprises a cobalt species on a titania support having, upon reduction at 425°C, a cobalt metal surface area, as measured by hydrogen chemisorption at 150°C, in the range from 15 to 100 m<sup>2</sup>/per gram total cobalt, comprising mixing together said titania support and an aqueous solution of cobalt ammine carbonate at a pH in the range 7.5 to 12, and then heating to a temperature in the range 60 to 110°C to effect decomposition of the cobalt ammine carbonate and precipitation of an insoluble cobalt compound onto said titania support, wherein the pH is maintained above 7.5 during the heating step, further comprising directly reducing the cobalt compound without a calcining step.

In other words, reduction is performed on the cobalt compound (e.g., basic cobalt carbonate species or cobalt oxide) without decomposition of the cobalt compounds to cobalt. See the present application at page 3, lines 7-9 and page 5, line 8. It is also noted that all of the examples in the present application were prepared without calcination.

Hu et al. does not disclose or suggest directly reducing the cobalt compound without a calcining step. Instead, Hu et al. focuses on drying **and calcining** the filtered material. See e.g., column 8, line 23 and column 10, line 19 of Hu et al. Additionally, Figures 5 and 6 in Hu et al. disclose calcining above 200°C. Moreover, Examples 1-10 in Hu et al. all provide oxidic products only in which the Co-containing products are calcined. This calcination is at 240°C or above, which causes conversion of the cobalt species present to Co<sub>3</sub>O<sub>4</sub> (e.g. see Y-axis of Figure 6). Therefore, Hu et al. does not contemplate direct reduction of the dried, but uncalcined material, i.e., material where the cobalt species have not been converted to Co<sub>3</sub>O<sub>4</sub> by a separate heating step. Calcination, by exposing the Co species to heat, causes some loss in Co surface area by sintering of the Co oxide crystallites. See Figures 5 and 6 of Hu et al. With

supports, such as alumina as disclosed in Hu et al., which have a high surface area over which to disperse the cobalt, this surface area loss is less critical than with low surface area supports, such as titania. The evidence provided in the Declaration shows that the crystallites obtained by the claimed invention are smaller than those given in Hu et al. Because cobalt surface area is inversely proportional to crystallite size, small crystallites can lead to higher surface areas and higher activities. The small crystallite size may be directly related to the direct reduction method claimed. Accordingly, the step of directly reducing without calcination is not disclosed nor rendered obvious by the disclosure of Hu et al.

The '481 Publication and the '381 Publication fail to remedy the deficiencies of Hu et al. As Hu et al., alone or in combination with the '481 Publication or the '381 Publication, fails to disclose or suggest directly reducing the cobalt compound without a calcining step, a *prima facie* case of obviousness has not been shown. Accordingly, claim 1 should be in condition for allowance. Claims 1-4, 6, 7, 18, and 19 depend, directly or indirectly, from claim 1 and should be allowable as dependent thereon.

In addition to the argument presented above, Applicant also maintains that a *prima facie* case of obviousness has not been shown because Hu et al., alone or in combination with the '481 Publication or the '381 Publication, fails to disclose or suggest (1) mixing together the titania support and an aqueous solution of cobalt ammine carbonate at a pH in the range 7.5 to 12, and *then* heating to a temperature in the range 60 to 110°C to effect decomposition of the cobalt ammine carbonate; (2) maintaining the pH above 7.5 during the heating step; and (3) a catalyst having a cobalt species on a titania support having, upon reduction at 425°C, a cobalt metal surface area, as measured by hydrogen chemisorption at 150°C, in the range from 15 to 100 m<sup>2</sup>/per gram total cobalt.

Hu et al., alone or in combination with the '481 Publication or the '381 Publication, fails to disclose or suggest mixing together the titania support and an aqueous solution of cobalt ammine carbonate at a pH in the range 7.5 to 12, and *then* heating to a temperature in the range 60 to 110°C to effect decomposition of the cobalt ammine carbonate.

The Office Action pieces together disparate parts of Hu et al. without providing a reason to combine the elements in the manner claimed. It is necessary, however, for the Office to identify a reason that would have prompted a person of ordinary skill in the relevant field to

combine the prior art elements in the manner claimed. See KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398 (2007). Here, the Office Action allegedly provides each of the claimed limitations, but has drawn the citations from disparate parts of Hu et al. In other words, Hu et al. does not disclose all the elements as arranged in the claim, and no reason is provided to modify the elements allegedly disclosed in Hu et al. in the manner claimed.

In Hu et al. the catalyst support is heated, and, once the support slurry temperature remains stable, then the support is mixed with an aqueous cobalt salt solution. See column 7, line 65 to column 8, line 9 of Hu et al. The washed support is then dried and calcined. In particular, the method disclosed in Hu et al. differs from that claimed because in the claimed invention the titania support and aqueous solution of cobalt ammine carbonate at a pH in the range 7.5 to 12 are mixed and *then* heated to a temperature in the range 60 to 110°C to effect decomposition of the cobalt ammine carbonate. On the contrary, in Hu et al., the ammonia cobalt complex is slowly added to an aqueous slurry of the support held already at a high temperature in the range 35 to 210°C. See column 7, lines 65 – column 8, line 9, and Example 1 of Hu et al. This influences the cobalt species deposited on the catalyst. Accordingly, there is no suggestion in Hu et al. and no reason presented that the method of Hu et al. should be altered in the manner claimed. The '481 Publication and the '381 Publication fail to remedy these deficiencies of Hu et al.

As Hu et al., the '481 Publication, and the '381 Publication, alone or in any reasonable combination, fail to disclose or suggest mixing together the titania support and an aqueous solution of cobalt ammine carbonate at a pH in the range 7.5 to 12, and *then* heating to a temperature in the range 60 to 110°C to effect decomposition of the cobalt ammine carbonate, a *prima facie* case of obviousness has not been shown. Accordingly, claim 1 should be in condition for allowance. Claims 1-4, 6, 7, 18, and 19 depend, directly or indirectly, from claim 1 and should be allowable as dependent thereon.

Additionally, Hu et al., alone or in combination with the '481 Publication or the '381 Publication, fails to disclose or suggest maintaining the pH above 7.5 during the heating step. It is unclear from Hu et al. if the pH is above 7.5 *when* the support and the aqueous cobalt salt solution are mixed or when heated. Hu et al. does not contemplate, however, maintaining the pH above 7.5 *during* the deposition (i.e., heating step). Maintaining the pH during deposition is important as the pH will naturally drift downwards from the alkaline to acidic as the ammonia is

driven off and the cobalt compounds are deposited. In particular, Hu et al. says nothing about pH in the Examples, which suggests that the maintenance of the pH range during the deposition is not considered important. As an example, it is evident from Example 1 of Hu et al. that failure to maintain the pH above 7.5 has left Co in solution, as evidenced by the "orange color" at the end of the procedure. In the claimed invention, however, Example 1 shows preparation of sample A where the solution was "clear" (i.e., colorless), which indicates that all of the Co had been deposited. The method of Hu et al., therefore, does not maintain the pH during the heating step. The '481 Publication and the '381 Publication fail to remedy this deficiency of Hu et al.

As Hu et al., the '481 Publication, and the '381 Publication, alone or in any reasonable combination, fail to disclose or suggest maintaining the pH above 7.5 during the heating step, a *prima facie* case of obviousness has not been shown. Accordingly, claim 1 should be in condition for allowance. Claims 1-4, 6, 7, 18, and 19 depend, directly or indirectly, from claim 1 and should be allowable as dependent thereon.

Finally, Hu et al., alone or in combination with the '481 Publication or the '381 Publication, fails to disclose or suggest a catalyst having a cobalt species on a titania support having, upon reduction at 425°C, a cobalt metal surface area, as measured by hydrogen chemisorption at 150°C, in the range from 15 to 100 m<sup>2</sup>/per gram total cobalt. Claim 1, as currently amended, recites that the cobalt metal surface area in the (reduced) catalyst, upon reduction at 425°C and as measured by hydrogen chemisorption at 150°C, is in the range from 15 to 100 m<sup>2</sup>/per gram total cobalt. Hu et al. does not disclose, explicitly or inherently, the surface area of the cobalt.

A catalyst having a cobalt species on a titania support with a cobalt metal surface area, upon reduction at 425°C and as measured by hydrogen chemisorption at 150°C, in the range from 15 to 100 m<sup>2</sup>/per gram total cobalt is not obvious by combining Hu et al. with the '481 Publication or the '381 Publication. In particular, it is recognized by those of ordinary skill in the art that titania has considerably lower surface area than other commonly used supports, such as alumina or silica. For example, the Degussa P25 titania used in the present application has a BET surface area of 50.6 m<sup>2</sup>/g, whereas the alumina used in the '480 Publication had a surface area of 145 m<sup>2</sup>/g, and the silica in the '381 Publication had a surface area of 255 m<sup>2</sup>/g.

Therefore, in terms of activity, one of ordinary skill in the art would avoid titania. Applicant has found, however, that high Co surface areas on titania are possible using the claimed method.

As Hu et al. and the '481 Publication or the '381 Publication, alone or in any reasonable combination, fail to disclose or suggest a catalyst having a cobalt species on a titania support having, upon reduction at 425°C, a cobalt metal surface area, as measured by hydrogen chemisorption at 150°C, in the range from 15 to 100 m<sup>2</sup> per gram total cobalt, a *prima facie* case of obviousness has not been shown. Accordingly, claim 1 should be in condition for allowance. Claims 1-4, 6, 7, 18, and 19 depend, directly or indirectly, from claim 1 and should be allowable as dependent thereon.

**Claims 9, 15, 16, and 17**

Independent claim 9, while not identical to claim 1, recites similar features including, "directly reducing the cobalt compound without a calcining step." Accordingly, for the reasons presented above, a *prima facie* of obviousness has not been established and claim 9 should be in condition for allowance. Claims 15, 16, and 17 depend from claim 9 and should be allowable as dependent thereon.

With respect to claims 16 and 17, they further differentiate the invention over Hu, the '481 Publication, and the '381 Publication. In particular, none of the references disclose or suggest a titania coated support as claimed. Examples 13 and 14 of the present application show that Co surface areas are markedly improved using these types of supports.

Accordingly, for all the foregoing reasons, a *prima facie* of obviousness has not been established and claim 9 should be in condition for allowance. Claims 15, 16, and 17 depend from claim 9 and should be allowable as dependent thereon.

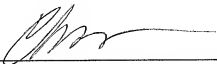
**Claims 20 and 21**

Claims 20 and 21 are new and while not identical to claim 1, recite similar features including, "directly reducing the cobalt compound without a calcining step." Accordingly, for the reasons presented above, a *prima facie* of obviousness has not been established and claims 20 and 21 should be in condition for allowance.

**Conclusion**

For all of the foregoing reasons, Applicant respectfully requests reconsideration and allowance of the claims. Applicant invites the Examiner to contact their undersigned representatives if it appears that this may expedite examination.

Respectfully submitted,



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Dated: May 25, 2010

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